SECTOR REPORTS

WIRELINE TELECOMMUNICATIONS

■ *Summary*

- In all likelihood, there will be dialtone when the phone is raised on New Year's day.

- Large carriers covering 92% of the nation's phone lines report that they will be fully tested and compliant by June 1999. Our assessment supports that claim.

- Medium and small carriers that serve many rural and insular areas lag somewhat behind, and generally will not complete their full remediation until the very end of 1999. The tight time schedule is cause for some concern.

- Test results are encouraging, showing that remediation to date has been successful.

- Private users are responsible for equipment used to connect to the network, such as phones, faxes, modems and PBXs. They must take steps to check and fix this equipment.

INTRODUCTION

The wireline telecommunications network is one of the most critical infrastructures that could be affected by the Year 2000 rollover. Individuals and companies worldwide rely heavily upon the wireline telecommunications network to communicate with other parties, transfer data, and to use the Internet.

Based upon available information developed by others, as well as by the Commission, we believe most domestic wireline telephones will work, that is, there should be dialtone when the handset is picked up and that calls should go through much as they do now. To the extent any Year 2000 problems are encountered, we expect them to be limited geographically and caused by carriers or customers that did not take adequate steps to avoid disruptions.

In this section of the report, we:
- 1) describe the telephone network, its participants, and its vulnerabilities to Y2K;
- 2) assess the industry's preparedness for the Year 2000 and the status of testing; and
- 3) discuss contingency planning.
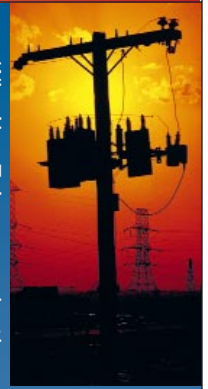
THE NETWORK

A conventional telephone call across the street typically involves only the local telephone carrier and its domestic telecommunications network. A call across the globe often involves a large number of domestic and international telecommunications networks. Thus, in assessing the potential impact of Year 2000 problems on our ability to make telephone calls, important questions involve the network origin and destination of these calls. Obviously, the more networks involved, the greater the chance the call might encounter a Year 2000 problem.
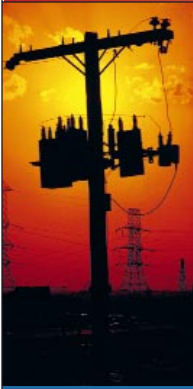
The telecommunications network can be illustrated using the simple schematic found in Figure 1. The left-hand side represents customer equipment and networks while the center and the right side make up the public network.

Network Subsystems

To understand better the vulnerability of our public networks to potential Year 2000 problems, we break down the network into its subsystems. Those subsytems are (1) network elements, (2) support systems, and (3) auxiliary systems. In varying degrees,
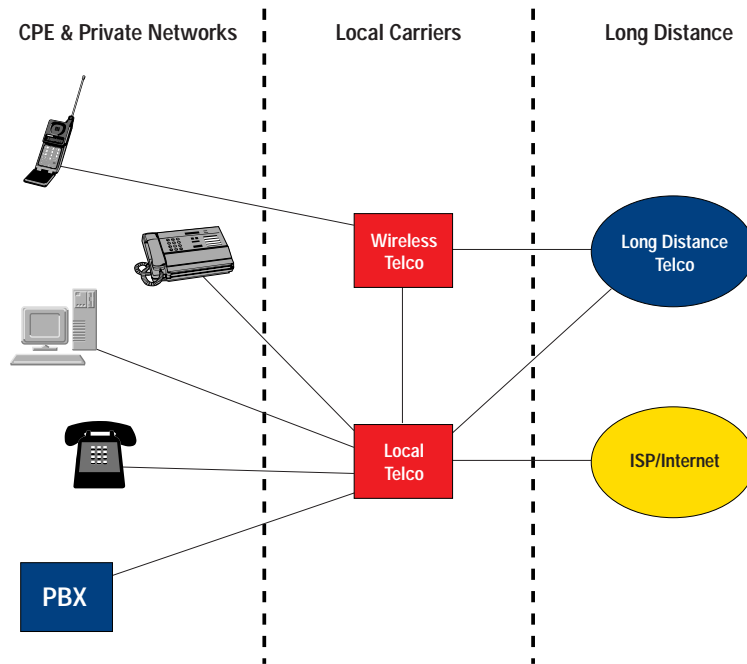
Wireline Telecommunications

Figure 1. The Network

each of these components must be Y2K compliant to ensure the availability of telephone service in the Year 2000.

Network Elements

Of these three, network elements are the most important. Network elements typically include switching and transmission systems, signaling systems, and network management systems.

Switching and Transport Systems: It may be useful to think of a switch as a waypoint to a destination and transmission equipment as the physical path to that destination. Only a single switch may be involved in completing a call across the street where many switches may be involved in long distance calls. If a Year 2000 problem disables a switch or some of the transmission equipment in a public network, traffic destined for that switch or traffic being handled by that equipment would either be re-routed to the destination by the signaling system or by the network management systems described below. Only if both of these systems fail would the call be blocked with a busy signal or pre-recorded message.

Signaling Systems: The completion of a conventional telephone call depends on the successful transmission of both the signaling portion and the subsequent voice portion of a call. The signaling portion provides call setup, maintenance, and termination. The signaling portion of a conventional call may either travel ahead of and along the same physical path as the voice portion or the signaling portion may be carried by an entirely separate network to conserve space on the voice network. Because of their heavy dependence on computer technology, the components of the signaling network are each vulnerable to potential Year 2000 problems and must be checked for these problems, just like the components of the transport network. Should Year 2000 problems be encountered in certain segments of the public telecommunications network, the nationwide signaling network will be important in

avoiding or reducing those problems. Absent other arrangements, these timing mechanisms prevent the accumulation (or "queuing") of calls waiting to be processed by the network. If this happens, the caller will get a busy signal. However, this can also happen when traffic is heavy, as we anticipate will be the case on New Year's Eve, 1999 or New Year's Day 2000. As a result, if a caller gets a busy signal, that caller should not automatically assume that a Year 2000 disruption has occurred.

Network Management Systems: A third group of network elements in telephone systems is the network management systems. Among other functions, these management systems monitor the traffic coming into, departing from, and moving within the network. Based on the traffic and other network constraints (e.g., blockages), these systems can re-route traffic within the network as appropriate. Such re-routing may be done manually by a network manager, automatically by the management system itself, or in both ways. Management systems become particularly important when switches, transmission equipment, signaling systems, or other network elements fail or become overloaded or when outside forces such as bad weather or line cuts constrain network performance. Accordingly, these management systems, like signaling systems, will be important to the avoidance or reduction of any Year 2000 problems that occur in the public network. Network management systems themselves may have Year 2000 problems associated with them. Thus, carriers must include such systems in their Year 2000 remediation processes and contingency planning. Because of their importance to the network, certain failures of these systems, regardless of the source, could disrupt communications on the public network.

Support and Auxiliary Systems

While not directly involved in the transmission, switching, or management functions of the public network, support and auxiliary systems play important roles in the continued functioning of telecommunications networks. These systems handle the key operations, administration, and maintenance functions of networks. In testimony before the Senate Special Committee on the Year 2000 Technology Problem, Dr. Judith List, Vice President, Integrated Technology Solutions at Bellcore (now known as Telcordia Technologies, Inc.), observed that there is little date-sensitive information in the fundamental call processing or data routing capabilities of the networks but that such information is found in support and auxiliary functions. The Committee's subsequent report on the impact of the Year 2000 problem noted that the disruption of these functions initially could cause some confusion for consumers with inaccurate bills and delays in service requests. The Committee also expressed concern that a buildup of such errors could eventually begin to degrade service.

Support systems control billing, the provision of service, maintenance, and limited network surveillance. Many date-sensitive operations are incorporated into support systems. Year 2000 problems in these systems could affect customer billing, the timely implementation of new services, or cause the cancellation of existing services. Similarly, a Year 2000 failure could delay critical maintenance until the failure is noted and corrected or until the service ceases. In this situation the Year 2000 problem might not become apparent until well after the Year 2000 rollover. Most carriers currently maintain back-up arrangements for their most critical support systems. For example, carriers usually have a battery and/or generator to maintain service in the event of power failures. For this reason, short-term problems with support systems are not expected to impact the handling of calls and other traffic by the public network. Auxiliary systems include payroll, human resources, management systems, security and alarm control, and environmental control systems. Because these systems are often highly automated, they may include date/time functions vulnerable to Year
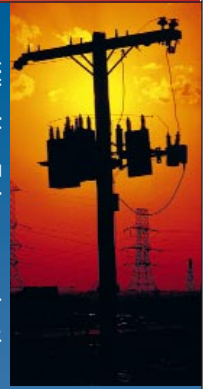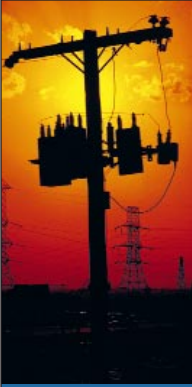
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2000 problems. Any Year 2000 or other failures in these systems, however, are not likely to interfere immediately with the supported telecommunications systems because of the indirect nature of that support. Adverse impacts, if any, are more likely to occur over a much longer period. Depending on the particular system involved, there might be no network impact if the problem is detected and addressed or only a delayed impact when the proper availability or functioning of that element becomes critical to network operation. There may be exceptions, however. For example, the failure of security systems or climate control in some cases might disrupt service immediately or more quickly than would otherwise be the case.

Customer Premises Equipment and Private Networks

■ *Summary*

- Customer premises equipment may be affected and is the responsibility of users.
- Owners of smaller private networks as well as residential and small business customers should inventory equipment and check with manufacturers to determine its Year 2000 readiness.
- Large private telephone networks are subject to Year 2000 problems similar to public networks.
- Carriers, manufacturers, and others maintain Internet websites with Year 2000 information on various types of customer premises equipment.

As important to customers as the network itself are the devices customers use to connect to it. Simple customer equipment, like a telephone handset, is unlikely to be adversely affected by Year 2000 problems. While handsets may include computer chips that facilitate such functions as automatic dialing, those chips are unlikely to have date/time functions that would be vulnerable to Year 2000 problems. Fax machines and devices that print out or keep track of the date may list the wrong date but should otherwise function. Larger, more complex equipment standing alone or configured into private systems may be vulnerable to Year 2000 problems to the extent that date/time functions are present in such equipment and integral to its operations. For example, financial transactions often require date/time stamps to document when transmissions are made.

Both large and small businesses must take a proactive approach to the remediation of potential Year 2000 problems. Because the telephone company's responsibilities generally end where private equipment connects to it, customers bear responsibility for the continued operation of their own equipment. Customers must check their own equipment and networks carefully and call their vendors or equipment providers to determine what steps they must take to ensure that their equipment will function in the Year 2000. The owners of private equipment should also make contingency plans for conducting their telecommunications business, should their equipment fail to operate.

Although our primary focus is on commercially operated private networks, we note that federal, state, and local government entities operate extensive private networks of their own. Like their counterparts in the private sector, these public sector networks may also be vulnerable to potential Year 2000 problems. The federal government operates both local and long distance networks, many of which are located on military installations. The federal government's long distance networks include the Federal Telecommunications System (FTS-2000), managed by the General Services Administration, the Defense Information System Network (DISN), and the Diplomatic Telecommunications Service (DTS). Several state governments

operate their own telecommunications systems to facilitate communications among state and local agencies.

While the Commission no longer exercises jurisdiction over customer equipment, it remains interested in that equipment because of its importance to the public network. In November 1998, the Commission sponsored a public forum entitled, "Year 2000: Maintaining Customer Premises Equipment and Private Networks." At that forum, Commissioner Michael Powell noted the growing public interest in potential Year 2000 problems with conventional computer systems but cautioned the public not to overlook potential Year 2000 problems within their own private networks. Due to the size and complexity of larger private networks, owners of those networks face somewhat different Year 2000 challenges than owners of smaller private networks. For this reason, we discuss them separately.

Small Private Networks

The Commission encourages owners of smaller private networks to review the six-phase analytical process (inventory, assessment, remediation, unit testing, integration and system testing, and rollout) outlined in the beginning of this report (and available on our web page) and adapt that process to their needs. Residential and small business customers should inventory all of their telecommunications equipment, review manufacturers' websites for information on the Year 2000 status of their equipment, and contact the manufacturers to follow-up on any questions not answered by the website. However, this process is not always an easy one. At the November 1998 forum, one participant noted that it is sometimes difficult for businesses to locate manufacturers for all of their telecommunications systems, particularly when essential components were installed many years ago or customized to the businesses' needs over time. Another problem is that the manufacturers of some key components may no longer be in business or may not maintain websites with detailed Year 2000 information on their products.

Where manufacturers of such key components are no longer in business, owners of such equipment are urged to determine what, if any, Year 2000 testing has been performed on that equipment by the distributor of that equipment, by the local telephone company, or by other organizations. For example, the General Services Administration maintains a website with extensive information on the Year 2000 status of various telecommunications equipment used by the Federal Government. The GSA website can be found at <y2k.fts.gsa.gov>.

The Senate Special Committee on the Year 2000 Technology Problem notes in its recent Year 2000 report that competition for resources in January 2000 may make it difficult for medium/small-sized businesses to secure help in resolving Year 2000 problems. Accordingly, the Committee cautioned such businesses and other organizations to make these communication systems a priority now.

Large Private Networks

Customers with large private networks have a much more complex task in addressing potential Year 2000 problems with their networks than those with small networks. Much like the local and long distance networks in the public telecommunications network, large private networks have a number of important and interrelated groups of network elements. Large private networks typically have one or more switches. One type of switch in a large private network is the private branch exchange or "PBX." A PBX may be used to route calls arriving at and departing from a business establishment. A Year 2000 problem within a PBX could interfere with traffic between the public network and the private network. For example, if the PBX serving the

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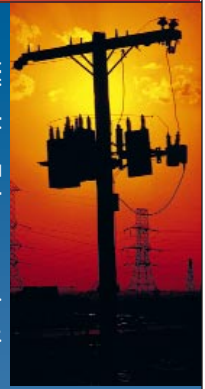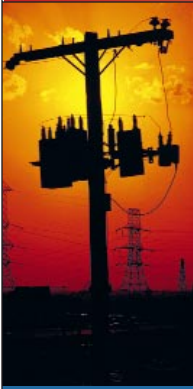
headquarters building of a large corporation was not made Year 2000-ready, headquarters employees might lose their dial tone or outgoing calls. These calls might be blocked with a busy signal or pre-recorded message. Like their public counterparts, private networks often include network management systems that may be vulnerable to Year 2000 problems. If they have not already done so, operators of private networks are urged to check with the company that built or maintains the network for information on potential Year 2000 problems.

Interface Between Public and Private Networks

One potential issue that has concerned many telephone companies and owners of private networks is whether Year 2000 problems in the public network could have an impact on private networks and vice-versa. NRIC examined this question and explains in its Report that Year 2000 problems with one network are not likely to migrate to connected systems. One possible exception, however, was noted at the Commission's November 1998 forum on customer equipment. At that time, one participant noted that a public network could "infect" a private network if the private network relied on management functions provided by a public network whose management functions were impaired by Year 2000 problems.

THE PARTICIPANTS

Local Telephone Carriers

The seven largest local telephone carriers in the United States are, in alphabetical order: (1) Ameritech, (2) Bell Atlantic, (3) Bell South, (4) GTE, (5) SBC Communications, (6) Sprint, and (7) US WEST. These carriers are responsible for approximately 98 percent of access lines reported to the Commission and approximately 92 percent of all access lines. Carriers with revenues that exceeded $109 million in 1996 were required to file reports with the Commission that contained data on such as access lines.

All other local telephone carriers fall into the category of medium/small carriers. We have included these carriers in one category for the purpose of our Year 2000 analysis because although numerous (there are 1,200-1,300 small- and medium-size local exchange carriers in the United States), they are responsible for only approximately 8 percent of the access lines in the United States. We discuss the results of our Year 2000 analysis of all local exchange carriers in the next Section of this report.

Long Distance Carriers

The three largest long distance carriers in the United States are, in alphabetical order: (1) AT&T, (2) MCI/WorldCom, and (3) Sprint. These carriers earn approximately 82 percent of all long distance revenues in this country. These carriers are independent and may be affiliated with any or all of the local carriers. In addition, there are a large number of medium/small long distance carriers. Although a few of the latter are facilities-based (i.e., they own the switching and cables necessary to provide long distance service), most such companies are resellers of the major carriers' long distance services. Accordingly, the impact of the three major carriers's remediation efforts is in effect higher than that indicated by their revenue share. Medium/small local carriers included in the Commission's survey that were also long distance resellers were also asked to report on their long distance remediation efforts.

ASSESSMENT

### Assessment of Local Telephone Carriers

■ *Summary*

- The Commission's assessment of the remediation activities of local telephone companies is based on numerous sources.
- The large local carriers are likely to be compliant by mid-year.
- Large carriers have devoted considerable resources to remediation and have shared information on best practices.
- Medium/small local carriers lag significantly behind the large local carriers in their remediation activities.
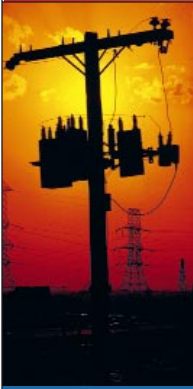
Methodology

Our primary sources for information on local carrier readiness for Year 2000 are surveys conducted by NRIC and the Commission. We also rely on information provided by the Rural Utility Service (RUS) of the United States Department of Agriculture and the National Telephone Cooperative Association. The surveys conducted by all these groups were supplemented by information obtained during industry meetings and at many forums sponsored by the Commission.

NRIC conducted a survey of 29 wireline local telephone companies. The survey subjects included the seven largest local carriers (i.e., the Bell Operating Companies, GTE, and Sprint) and 22 medium/small-sized local carriers. The latter group included a representative sample of such carriers available to NRIC. The 29 survey subjects collectively represent approximately 93-94 percent of the switched access lines in the country. This survey asked the subjects to report on four major activities associated with Year 2000 preparation. The activities are: a) awareness, defined as inventorying and assessing system components; b) renovation, defined as making necessary upgrades; c) validation, defined as unit and interoperability testing; and d) implementation, defined as installation and rollout of the compliant system elements. NRIC requested the subjects to respond to identical surveys for two time periods (September 1998 and December 1998) in order to assess not only the status of preparedness, but also to evaluate how quickly these carriers were remediating their systems.

To supplement the work of NRIC with respect to small carriers, the Commission conducted its own survey of 1,200 medium/small local carriers and long distance resellers that account for the remaining access lines in this country. Although these carriers were directed to report on their Year 2000 efforts for their local operations, we also asked for information regarding other types of telecommunications services they may provide, such as long distance or wireless services. Of the 1,200 companies surveyed, 654, or 55 percent, responded by the response deadline. Of the timely respondents, 589 are medium/small local carriers, and 65 are small long distance resellers. The survey respondents were asked to provide information on a number of issues. These included: 1) what resources they were using to address Year 2000 issues; 2) their interaction with vendors and other carriers; 3) the standard they have adopted, if any, for Year 2000 compliance; and 4) whether they have a formal remediation process. The survey questionnaire is attached to this report. In addition, respondents were asked to fill in matrices showing the progress of their remediation and contingency planning.
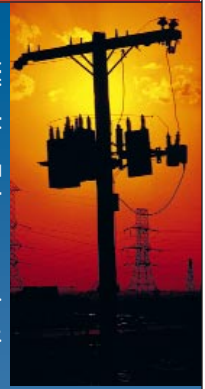
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RUS conducted a voluntary survey of its electric and telecommunications company borrowers. RUS received responses to all of its survey questions from only 100 of the 457 telecommunications companies queried. Other respondents answered only a portion of the questions posed in the survey. Although incomplete, the RUS survey results are supportive of the other surveys conducted on wireline carrier Year 2000 preparedness.

Assessment Results for Local Telephone Carriers

The largest local carriers are well on their way to being Year 2000 compliant. NRIC projects that each of these carriers will be 100 percent compliant, including having their contingency planning in place, by the second quarter of 1999. The medium/small local carriers are generally not as far along on the timeline for compliance, but those responding to the surveys do plan to be fully Year 2000 compliant by the fourth quarter, 1999.

Large Local Carriers

The NRIC study is our primary source of information for the analysis of the readiness of the seven largest local carriers. Since these carriers control 92 percent of the access lines in the country, the extent of these carriers' Year 2000 readiness is of paramount importance. Fortunately, the news is good with regard to the preparedness of these carriers.

The NRIC data indicate that, as of September 1998, 71 percent of the largest local carriers' systems had been renovated (remediated) for Year 2000 problems. This includes all aspects of their systems, including auxiliary systems, relating to non-communications elements of their physical plants. As shown in Figure 2, by December 1998, the progress of these carriers' renovation effort had increased to 86 percent. Similar progress was made in all other aspects of achieving compliance.

The data suggest that the large local carriers are moving rapidly towards deploying Year 2000 upgrades. NRIC projects that the largest carriers will have completed all remediation activities by June 1999. Based on the progress being made, as well as the projected June completion date, the vast majority of access lines in the United States will be remediated and therefore will have a high probability of working on January 1, 2000. The progress of the large carriers can also be seen in Figure 3 that shows the progress that they are making on key system components.
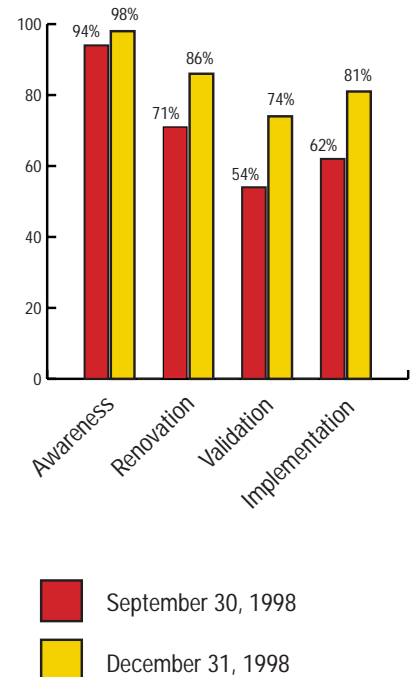

Legend:
- September 30, 1998 (red)
- December 31, 1998 (yellow)

Figure 2. Y2K Lifecycle Compliance Status Rate of Change; Large Local Telephone Carriers; September–December 1998
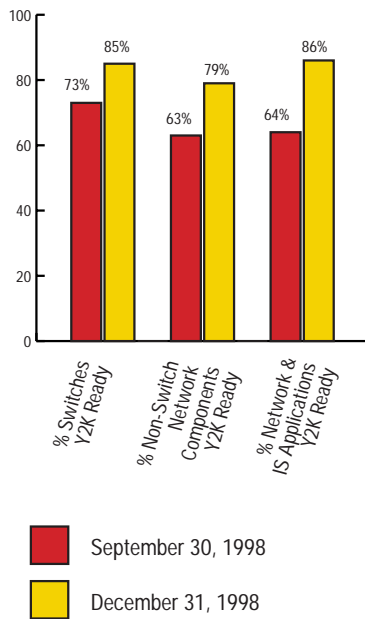
Figure 3. Large Local Telephone Carrier Compliance Status; Rate of Change; September–December 1998
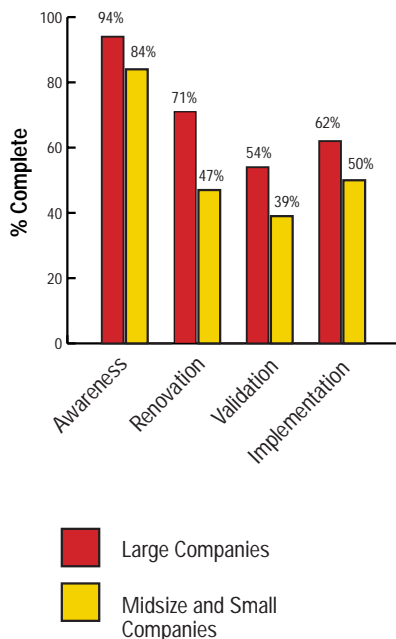

Figure 4. Y2K Lifecycle Compliance Status; Large - and Medium-Size Local Telephone Carriers; September 30, 1998
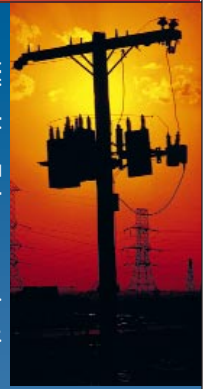
Medium/Small Local Carriers
Although they control only approximately 8 percent of the access lines in this country, the medium/small local carriers provide telephone services to many households and businesses, some of which serve rural and remote areas. For these customers, the telephone is of life-or-death importance, even more so since Year 2000 falls in the winter season for much of the country, when adverse weather conditions may create or compound emergencies. Other medium/small carriers serve urban areas where they are used to conduct business, permit residents to remain in contact, and ensure the availability of government and emergency services.
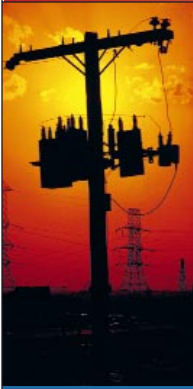
NRIC Study — Data for the 22 medium/small local carriers surveyed by NRIC indicate that, as of September 30, 1998, these carriers lagged behind the large carriers in Year 2000 preparedness.

As can be seen in Figure 4, NRIC estimates that the medium/small carriers are approximately 24 percent behind the major local carriers in implementing remediation of equipment. Looking at the major system components, the NRIC data again show that the medium/small carriers lag behind the large carriers except in non-switched network components, where they have a slight edge. See Figure 5.

Commission Survey — In order to supplement the NRIC survey with respect to small carriers, the Commission requested medium/small carriers to indicate the status of their remediation activities as of the end of December 1998 and to project when they planned on completing them. Figures 6-11 show the progress for the roughly 50 percent of carriers that indicated that they had formal remediation plans. Each chart represents one phase of the remediation life cycle and breaks down equipment and software into network elements, support systems, and auxiliary systems.

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The Commision data presented in the charts support NRIC's conclusion that medium/small local carriers lag behind the large carriers in remediation planning. In fact, the Commission's survey results suggest that the lag may be greater than what is shown by NRIC's data. A direct comparison for each step of the remediation cycle between the medium/small local carriers surveyed by NRIC and the medium/small carriers surveyed by the Commission is somewhat complicated by the more detailed steps used in the Commission survey. As noted, NRIC used a four-step remediation analysis instead of the six-step analysis used by the Commission. In spite of this difference, we believe that an overall comparison can be made between the level of remediation achieved by the medium/small carriers surveyed by NRIC and the level of remediation achieved by medium/small carriers surveyed by the Commission. As shown in Figure 5, NRIC reports that by the end of 1998, the medium/small local carriers remediated 62 percent of their switches, 65 percent of their non-switch components, and 60 percent of their network information systems applications. The Commission data indicates that by the end of 1998, medium/small carriers responding to its survey indicate that they had remediated only 19 percent of their switch elements, 14 percent of their support systems, and 20 percent of their auxiliary systems. We believe that this difference is directly attributable to the size of carriers surveyed. NRIC's sample of medium/small carriers was limited to 22 carriers and may have included a greater proportion of larger carriers than the Commission's survey. The Commission's survey was heavily weighted toward small, non-reporting local carriers that serve rural America.
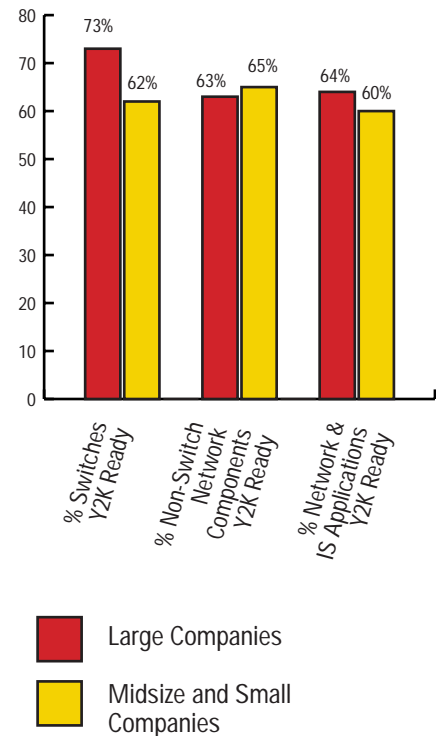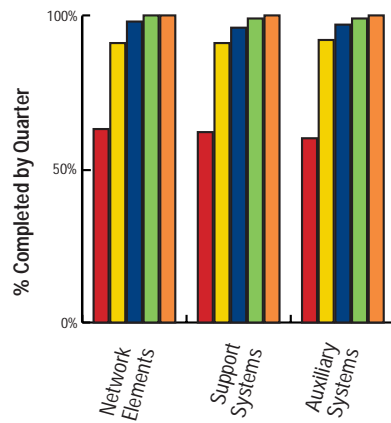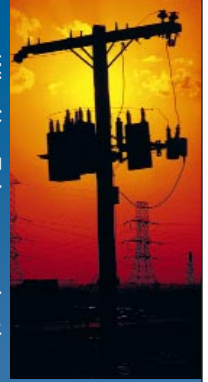
The figures also show that many carriers surveyed by the Commission that have formal remediation plans appear to have delayed some important activities until 1999. We believe that this may leave insufficient time for remediation, testing, and where appropriate, rollout, should unforeseen events occur.

These results indicate that small carriers may need additional support in remediating their systems. We plan to work with NRIC and NARUC to determine any problems these companies may be encountering in getting ready for Y2K. We will also continue our outreach to these groups.

Medium/Small Carriers Without Formal Remediation Plans
The data collected in the Commission survey indicates that nearly half (46 percent, or 300 of 654) of medium/small carriers surveyed reported not having formal processes for managing Year 2000. This finding is of signigicant concern to us because without plans these carriers may not be taking the necessary steps to become Year 2000-ready.

Figure 5. Y2K U.S. Public Switched Telephone Network Compliance Status; Large- and Medium-Size Local Telephone Carriers

Wireline Telecommunications

% Completed by Quarter

	Network Elements	Support Systems	Auxiliary Systems
Completed*	63%	62%	60%
1st Qtr 99	91%	91%	92%
2nd Qtr 99	98%	96%	97%
3rd Qtr 99	100%	99%	99%
4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 6. Inventory — Medium/Small Telephone Cos. Percent Complete

% Completed by Quarter
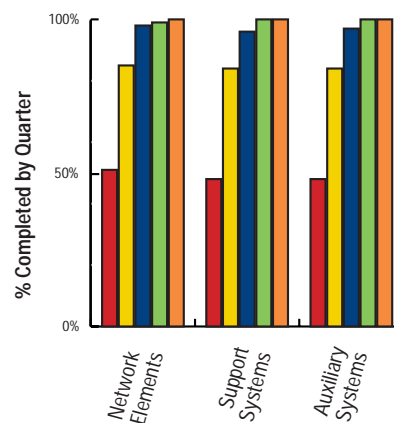
	Network Elements	Support Systems	Auxiliary Systems
Completed*	51%	48%	48%
1st Qtr 99	85%	84%	84%
2nd Qtr 99	98%	96%	97%
3rd Qtr 99	99%	100%	100%
4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 7. Assessment — Medium/Small Telephone Cos. Percent Complete

% Completed by Quarter
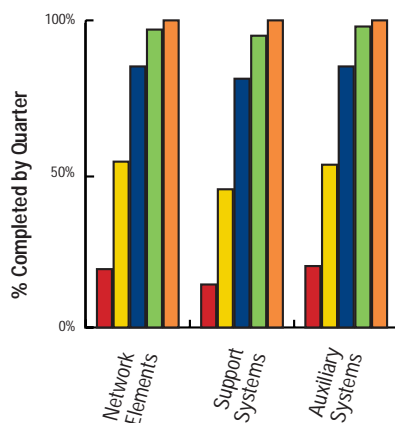
	Network Elements	Support Systems	Auxiliary Systems
Completed*	19%	14%	20%
1st Qtr 99	54%	45%	53%
2nd Qtr 99	85%	81%	85%
3rd Qtr 99	97%	95%	98%
4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 8. Remediation — Medium/Small Telephone Cos. Percent Complete

% Completed by Quarter
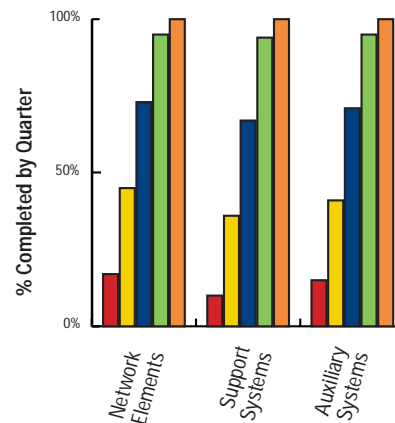
	Network Elements	Support Systems	Auxiliary Systems
Completed*	17%	10%	15%
1st Qtr 99	45%	36%	41%
2nd Qtr 99	73%	67%	71%
3rd Qtr 99	95%	94%	95%
4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 9. Unit Testing — Medium/Small Telephone Cos. Percent Complete

Wireline Telecommunications
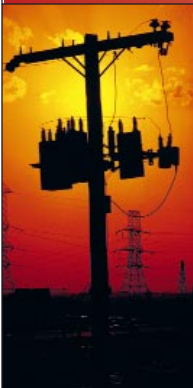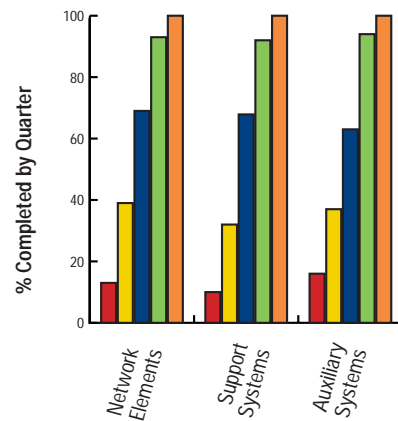
	Network Elements	Support Systems	Auxiliary Systems
■ Completed*	13%	10%	16%
■ 1st Qtr 99	39%	32%	37%
■ 2nd Qtr 99	69%	69%	63%
■ 3rd Qtr 99	93%	92%	94%
■ 4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 10. Integrated Testing — Medium/Small Telephone Cos. Percent Complete

	Network Elements	Support Systems	Auxiliary Systems
■ Completed*	20%	15%	16%
■ 1st Qtr 99	49%	37%	41%
■ 2nd Qtr 99	66%	59%	64%
■ 3rd Qtr 99	85%	88%	88%
■ 4th Qtr 99	100%	100%	100%

*prior to 1/1/99

Figure 11. Rollout — Medium/Small Telephone Cos. Percent Complete
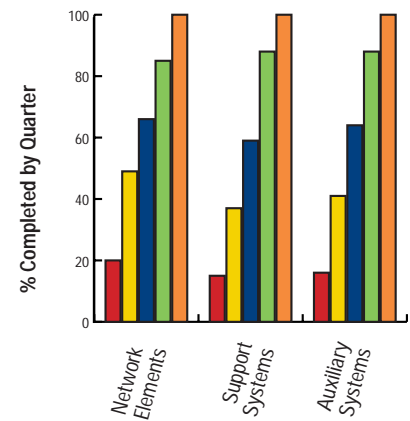
Because of the complex issues and many decisions that carriers need to make to become Year 2000 ready, formal plans for remediation and contingencies are vital. A concrete planning process helps carriers identify what actions they must take and how quickly they must take them to complete all required remediation and contingency activities. The availability of documented plans also allows Federal and State regulators to measure the progress individual carriers are making to become Year 2000 compliant. With this information, governments are better positioned to support the activities of the carriers and to protect the interests of subscribers.

To better evaluate whether medium/small carriers without formal plans are taking the steps needed to address Year 2000 issues, we examined responses by all carriers to the Commission's survey questions that focused on their knowledge of Year 2000 problems and their activism in resolving them. We then compared responses for carriers that indicated that they had formal processes for remediation and contingency planning to those who did not have concrete plans. We found that carriers without formal planning processes appear to be less informed about Year 2000 issues and less proactive than carriers with plans. Based on this observation, we conclude that carriers that have not planned their remediation activities may have a greater probability of having service disruptions following the Year 2000 rollover than carriers that have such plans as we would suspect. However, we note that nearly all carriers, irrespective of whether or not they reported plans, indicated that their relationship with vendors and customers was "very satisfactory" or "moderately satisfactory." We find this outcome encouraging because vendors are a primary source of information and guidance on remediation. For a complete analysis of the responses to these questions, please refer to page 113.

Conclusions and Remaining Concerns

The preliminary results of the Commission's December 1998 survey and those reported by NRIC for September and December 1998 suggest differences between the progress made by large carriers, on one hand, and that being made by medium/small carriers, on the other. In addition, it appears that the difference in the progress they are making to correct potential Year 2000 problems is reflected in the level of planning that each group appears to have taken for Year 2000 remediation. Specifically, the larger carriers have devoted more resources to planning and management, and have taken a more comprehensive approach to identifying all possible elements that could adversely be affected both on a system-wide and on a national scale. The large carriers have demonstrated a high-level of cooperation among themselves and with their vendors in sharing industry "best practices," which has allowed them to move forward more quickly in addressing Year 2000 problems. The medium/small carriers are lagging behind, with only approximately half of them reporting having formal processes. Those reporting no formal planning process appear to be the furthest behind. Finally, the Commission's finding that medium/small carriers had remediated only 19 percent of their switch elements, 14 percent of their support systems, and 20 percent of their auxiliary systems by the end of 1998 is somewhat below the progress reported in the RUS survey. Nonetheless, both the Commission survey and the RUS survey confirm that medium/small telephone carriers lag significantly behind the largest U.S. carriers in preparing for the Year 2000.

Long Distance Carriers

■ *Summary*

- As of December 1998, long distance carriers remediated 74-84 percent of their system components, and plan to complete all remediation by June 1999.
- Long distance service may be disrupted if the local carrier connecting a subscriber to the long distance carrier suffers a service disruption.
- Competition for long distance services and the ability to "dial around" by dialing a 10-xxxxx code will protect subscribers if their long distance carrier fails to provide service.

Methodology

In assessing the progress of the long distance industry in addressing Year 2000 problems, we focus on the status of the three largest carriers. We believe that the progress of the three largest long distance carriers for Year 2000 preparation is representative of the entire industry. Consequently, we believe that most, if not all, long distance service will be operational on January 1, 2000 — provided that there is no service disruption at the local level. As we noted earlier, local carriers connect their subscribers to long distance networks and therefore represent a vital link in the provision of long distance service.

If a local carrier suffers a Year 2000 disruption, both one's local and long distance services will be likely to be impaired, even if the long distance network is fully operational. Therefore, a subscriber's ability to make long distance calls will depend on the progress his or her local carrier has made in remediating its system.

NRIC Survey

NRIC's survey asked each of the three major carriers about the readiness of their major components such as switches, non-switch network components, and network information system components. Figure 12 shows the carriers' responses. Note that these carriers are progressing rapidly in remediating their networks. As with the
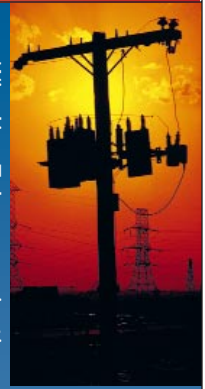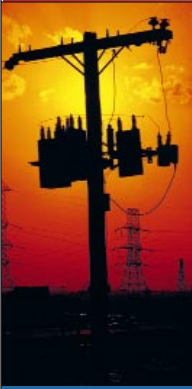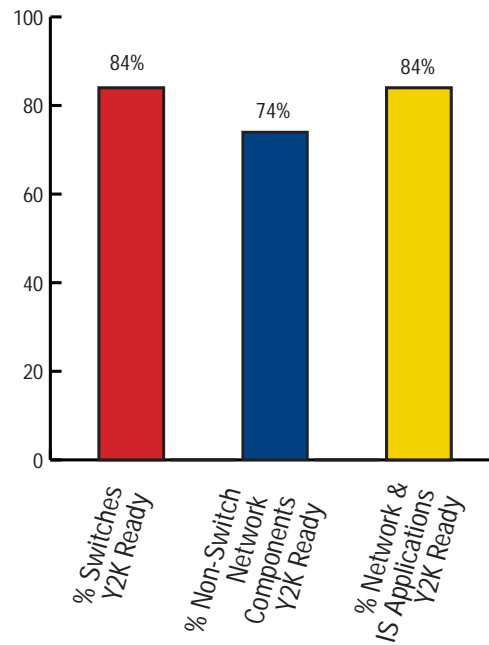
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Figure 12. Public Switched Telephone Network Y2K Readiness; Major Long Distance Carriers

largest local carriers, the largest long distance carriers plan to complete their remediation activities by June 1999.

Subscribers that use long distance companies, other than the three surveyed by NRIC, need not be overly concerned about losing long distance service after January 1, 2000. The long distance industry is highly competitive and all long distance carriers, both facilities-based and resellers, are concerned about losing customers due to service disruptions. Therefore, we are confident that each company will make the necessary changes to their system to prevent service loss. Nonetheless, should a long distance carrier's system fail, it is relatively easy for its subscribers to select immediately an alternative long distance carrier. Most subscribers have the capability of "dialing around" their prescribed long distance company by using an alternative carrier's identification code prior to dialing the called party's phone number. Each carrier has a seven-digit "dial around" code (i.e., 10-xxxxx) and will provide that code to the public upon request.

TESTING OF EQUIPMENT

■ *Summary*

- Testing for potential Year 2000 problems is divided into five layers: vendor testing, company testing, intra-network testing, inter-network testing, and international testing.
- Reported test results are encouraging.

Paralleling the remediation efforts of the telecommunications industry is an industry supported, comprehensive and redundant testing program designed to ensure that all Year 2000 fixes will be robust under all circumstances. Testing of the
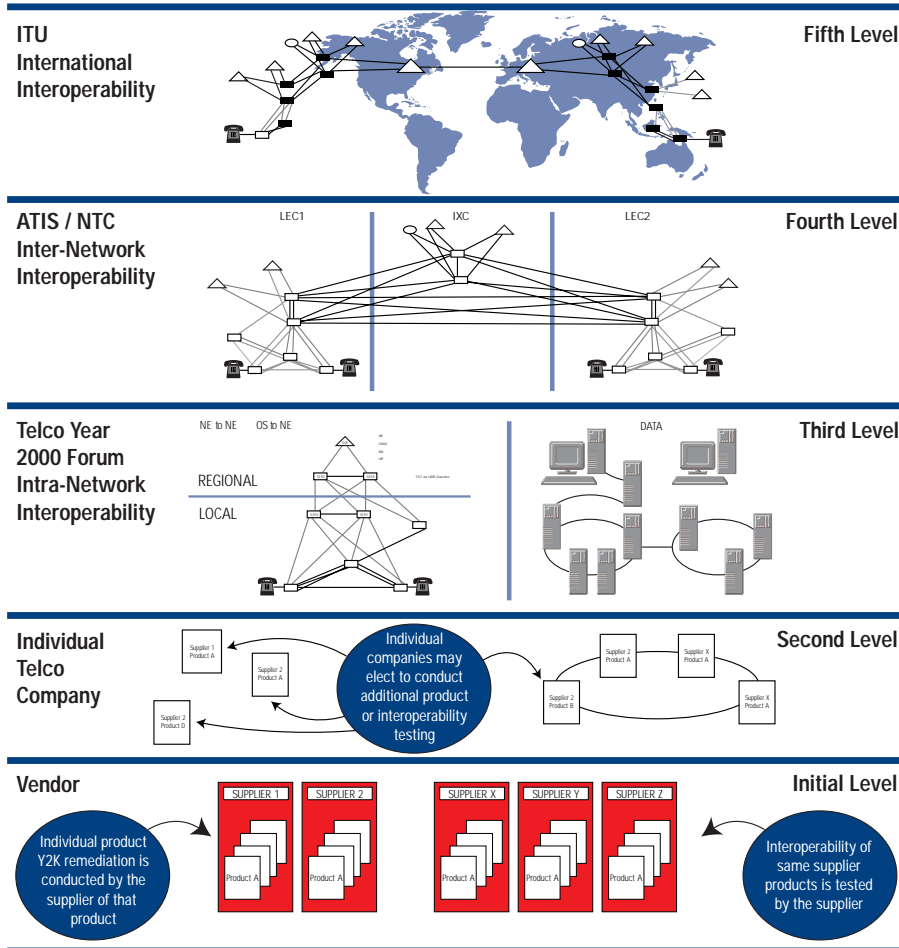
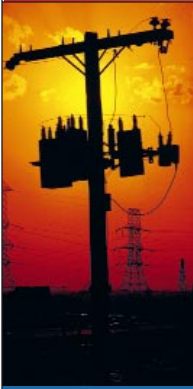*Figure 13. Testing has progressed to the Fifth Level.*

same software is being conducted at five levels or layers, each layer being more complex than the prior layer. See Figure 13.

The first layer is at the vendor level. Once a vendor has developed a software fix, it tests that fix at its facilities. Vendor testing is particularly important for small carriers who rely upon vendors to do their unit testing. The second layer is telephone company testing. This level of testing is primarily carried out by the larger companies, which either have their own testing facilities or access to other testing facilities. The next three layers involve more complex network testing.

The third layer of testing is intra-network testing, which tests remediation within a network. The Telco Year 2000 Forum has undertaken this activity. The Telco Forum is an industry group comprised of seven of the largest local carriers: Ameritech, Bell Atlantic, Bell South, Cincinnati Bell, GTE, Southern New England Telephone (purchased in 1998 and now an SBC company), SBC, and US WEST. It is a voluntary, self-funded group that was organized in late 1996 to share information among telephone companies in preparation for the Year 2000.

The Telco Forum spent six months testing system interoperability of equipment and software to identify and minimize potential Year 2000 complications. The testing evolved equipment and software common to the Telco Forum member companies and took place in 20 laboratory environments to simulate network activity and how

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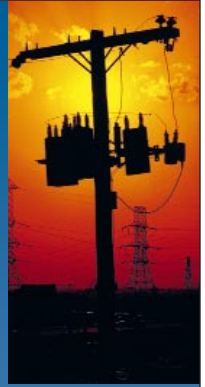
it might be affected by the Year 2000. Together, the companies tested the way the equipment would interact in various configurations, and how it might be affected by the Year 2000. Only six anomalies related to Year 2000 were detected in 1,914 test-cases; the six were resolved, retested, and subsequently passed. The Telco Forum test results further support our belief that the public telecommunications network will be functional on January 1, 2000 and that call voice and data call processing will continue without significant disruptions during the Year 2000 transition. Companies or interested parties wishing more detailed information of the Telco Forum testing activities should contact the Forum directly via its website at <www.telcoyear2000.org>.

The next layer of testing is interoperability testing. This regimen of testing is designed to determine the reliability of the interconnected telephone network. This testing is being conducted by an industry working group under the auspices of the Alliance for Telecommunications Industry Solutions (ATIS). The group, known as the Network Testing Committee (NTC), is focusing on call processing, mass calling events and congestion, cross-network services, call completion (credit card/calling card validation, toll free service), rollover to Year 2000 in a local number portability environment, impact of time zones, Government Emergency Telecommunications Service and wireless-to-wireline call completion network impacts. Preliminary review of the data from the testing has been encouraging.

Service providers participating in NTC Year 2000 testing include AT&T and Sprint (as long distance carriers), and Ameritech, GTE, and US WEST (as local carriers). Suppliers including Bellcore (now Telcordia Technologies, Inc.), Lucent, Nortel Networks, and Siemens supported the testing effort by providing equipment and resources. Equipment supplied by these companies for testing represents equipment currently in use in the nation's telecommunications network that services over 90 percent of the users. The Cellular Telecommunications Industry Association and several of its suppliers (Ericsson, Hughes/Alcatel, Lucent Technologies, Motorola, Nokia, and Nortel Networks) partnered with the NTC to complete the wireless to wireline Year 2000 interoperability testing. More detailed information on the NTC's Year 2000 testing activities, including descriptions of the tests that were executed and the test network configuration, may be found at the NTC website, <www.atis.org/atis/iitc/ntc/ntchom.html>. A detailed report describing the testing, the test results and any industry recommendations will be available in April.

The International Telecommunication Union (ITU) is conducting the final layer of testing. These tests are designed to ensure that Year 2000 remediation efforts in different countries are compatible and that international calling will not be disrupted or that problems associated with the Year 2000 rollover on one country's telecommunications system do not infect other telecommunication systems in other countries. Details of the status of ITU testing is reported in the International Communications section of this report on page 81.

Contingency Planning

■ *Summary*

- Remediation and contingency planning are not substitutes for one another.
- Large carriers will report contingency planning progress through the NRIC in mid-April.
- Of the medium/small carriers included in the Commission survey, only 38 percent reported any contingency planning activity.
- Reporting carriers in the Commission survey plan to complete only approximately half of their contingency planning by the end of the 1st quarter 1999.
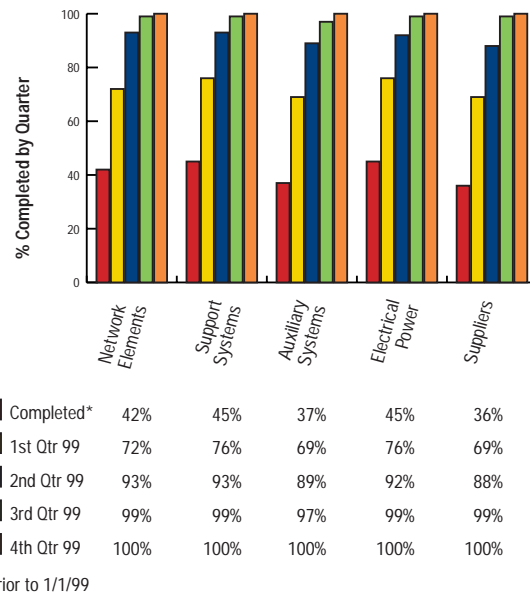
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% Completed by Quarter

(chart — Figure 14)

Network Elements | Support Systems | Auxiliary Systems | Electrical Power | Suppliers

	Network Elements	Support Systems	Auxiliary Systems	Electrical Power	Suppliers
Completed*	42%	45%	37%	45%	36%
1st Qtr 99	72%	76%	69%	76%	69%
2nd Qtr 99	93%	93%	89%	92%	88%
3rd Qtr 99	99%	99%	97%	99%	99%
4th Qtr 99	100%	100%	100%	100%	100%

*prior to 1/1/99

Figure 14. Probability of Failure and Risk — Medium/Small Telephone Co. Percent Complete

% Completed by Quarter

(chart — Figure 15)

Network Elements | Support Systems | Auxiliary Systems | Electrical Power | Suppliers

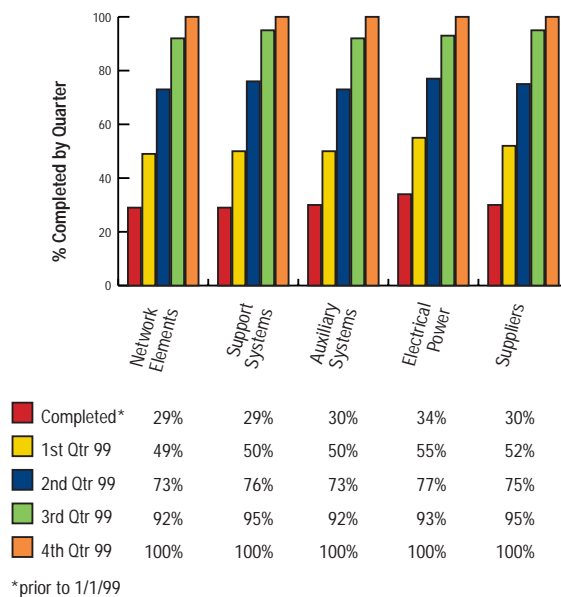|	Network Elements	Support Systems	Auxiliary Systems	Electrical Power	Suppliers
Completed*	29%	29%	30%	34%	30%
1st Qtr 99	49%	50%	50%	55%	52%
2nd Qtr 99	73%	76%	73%	77%	75%
3rd Qtr 99	92%	95%	92%	93%	95%
4th Qtr 99	100%	100%	100%	100%	100%

*prior to 1/1/99

Figure 15. Contingency Planning — Medium/Small Telephone Co. Percent Complete

NRIC defines "contingency planning" as "the development of a documented plan that provides for alternative procedures to deliver the minimum acceptable level of output for a specific/unique business disruption or risk that is known and often time-bounded (e.g., work stoppage, millennium change, and Euro conversion)." Remediation and contingency planning are not substitutes for one another; rather, both comprise critical and complementary elements in any well-planned process for Year 2000 transition.

The large local and long distance carriers have indicated to us that they are in the process of developing very comprehensive and complete contingency plans. While precise completion dates have not been reported, we have been in constant contact with NRIC on this question. Based on the informal reports we have received, we believe that the largest carriers will complete their contingency plans by mid-year. NRIC will provide a full report on the status of the large carriers' progress at their April 14, 1999 meeting.

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For the medium/small local telephone companies included in the Commission analysis, only 38 percent report having begun contingency planning activities, 57 percent indicated that they have no contingency plans, and 5 percent did not respond to the question. Comments by several of these carriers further suggest that their contingency planning tends to focus on developing backups for switching and billing activities. The progress reporting that carriers have made on their risk assessment and contingency planning is shown in Figures 14 and 15.

As the charts show, approximately half of the planning by the medium/small carriers will be completed by the end of the 1st quarter of 1999. Because such plans are necessary to ensure continuity of operations, delaying a large share of contingency planning well into 1999 may be problematic.

We emphasize that there is no assurance against random Year 2000 disruptions, despite the thorough and deliberate remediation efforts any entity may undertake. It is simply not possible to foresee all points of disruption from Year 2000 problems; moreover, Year 2000 disruptions may come from more than a single point-of-failure. Therefore, it is essential that all carriers and users of telecommunications services (as well as manufacturers) develop comprehensive contingency plans to ensure that business operations are not adversely impacted by Year 2000 disruptions, and that, if any problems do occur, recovery is accomplished as promptly as possible. Also, as previously noted, there are a number of other critical dates or "event horizons" both prior to, and in addition to, the rollover to January 1, 2000, and these may require action earlier than otherwise expected.

Consumer Tips

- Try to place important phone calls, particularly those overseas, before or after New Year's Day.
- Minimize phone use on that day (including modems). Heightened traffic volume could over tax the network.
- Have at least one phone available that does not rely on electric power to operate. Cordless phones normally do not work without a separate power source.
- If problems are encountered with an urgent call, wait several minutes before re-attempting the call. If a problem remains after a second attempt, try a different telephone to complete the call. If these problems persist, check with neighbors to see if they can assist with an urgent call.
- If you encounter a problem with your wireline phone, try a PCS or cellular phone. Be sure to check the battery.
- Don't worry and enjoy your New Year's Day; any disruption in phone service is likely to be minor and temporary.